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**(54) INK JET PRINTING HEADINK JET PRINTER WITH THE SAMEAND METHOD FOR
MANUFACTURING INK JET PRINTING HEAD**

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent a printing quality decrease by a positional deviation of discharge nozzles and also stabilize a recording paper landing position of discharged ink.

SOLUTION: A nozzle sheet 23 is set which is formed by a metal electroforming layer formed of nickel or a material including the nickel and has a discharge nozzle array formed for each ink color. A plurality of head chips 25 having a plurality of heaters are arranged. The head chips 25 are bonded to the nozzle sheet 23 while registered to the side of a grow face of the nozzle sheet to make discharge nozzles and heaters correspond to each other for each predetermined number of the discharge nozzles of the discharge nozzle array for each color. Moreover the discharge nozzle array for each color is formed into a serpentine array so that a part of the predetermined number of discharge nozzles overlaps with respect to a paper feed direction for each predetermined number of discharge nozzles. The head chips 25 are arranged into a serpentine form to match the discharge nozzles.

CLAIMS

[Claim(s)]

[Claim 1]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanAn ink jet print head provided with one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formed.

[Claim 2]The ink jet print head according to claim 1wherein a nozzle sheet is formed by a metal electroforming layer by material containing nickel or this nickel and changes.

[Claim 3]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board memberAn ink jet print head which doubles a position with said nozzle sheetpastes together so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every colorand is characterized by things.

[Claim 4]The ink jet print head according to claim 3wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 5]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board memberAn ink jet print head which doubles and pastes a position together to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every colorand is characterized by things.

[Claim 6]The ink jet print head according to claim 5wherein a nozzle sheet is formed by a metal electroforming layer of

material containing nickel or this nickel and changes.

[Claim 7]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink jet print headwherein a regurgitation nozzle row for said every color is formed so that a sequence may be accomplished in said direction of a print span at approximately straight line shapeand said board member is arranged so that a sequence may be accomplished to straight line shape according to said regurgitation nozzle.

[Claim 8]The ink jet print head according to claim 7wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 9]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheet aforementioned nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink jet print headwherein a regurgitation nozzle row for said every color is formed so that a sequence may be accomplished to approximately straight line shapeand said board member is arranged so that a sequence may be accomplished to straight line shape according to said regurgitation nozzle.

[Claim 10]The ink jet print head according to claim 9wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 11]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink jet print headwherein a regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished for every regurgitation nozzle of said predetermined numberand said board member is alternately arranged according to said regurgitation nozzle.

[Claim 12]The ink jet print head according to claim 11wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 13]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink jet print headwherein a regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished for every regurgitation nozzle of said predetermined numberand said board member is alternately arranged according to said regurgitation nozzle.

[Claim 14]The ink jet print head according to claim 13wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 15]In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board member for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. Double a position with said nozzle sheetpaste togetherand so that said regurgitation nozzle and said recording element may correspond and a regurgitation nozzle row for said every colorAn ink jet print headwherein it is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined numberand a sequence may be accomplished alternatelyand said board member is alternately arranged according to said regurgitation nozzle.

[Claim 16]The ink jet print head according to claim 11wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 17] In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed two or more owners of the board member which carries out two or more owners of said recording element being carried out and a position being doubled and it pasting together and said board member to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and a sequence may be accomplished alternately An ink jet print head wherein said board member is alternately arranged according to said regurgitation nozzle.

[Claim 18] The ink jet print head according to claim 17 wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 19] In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print span An ink-jet printer provided with one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed.

[Claim 20] The ink-jet printer according to claim 19 wherein a nozzle sheet is formed by a metal electroforming layer by material containing nickel or this nickel and changes.

[Claim 21] In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print span It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed An ink-jet printer which carries out two or more owners of the board member which carries out two or more owners of said recording element doubles a position with said nozzle sheet pastes said board member together so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color and is characterized by things.

[Claim 22] The ink-jet printer according to claim 21 wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 23] In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print span It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed Carry out two or more owners of the board member which carries out two or more owners of said recording element and said board member An ink-jet printer which doubles and pastes a position together to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color and is characterized by things.

[Claim 24] The ink-jet printer according to claim 23 wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 25] In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print span It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed two or more owners of the board member which carries out two or more owners of said recording element being carried out and a position being doubled and it pasting together to said nozzle sheet and said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink-jet printer wherein a regurgitation nozzle row for said every color is formed so that a sequence may be accomplished to approximately straight line shape and said board member is arranged so that a sequence may be accomplished for said regurgitation nozzle at 1 in all linear shape.

[Claim 26] The ink-jet printer according to claim 25 wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 27] In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print span It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed two or more owners of the board member which carries out two or more owners of said recording element being carried out and a position being doubled and it pasting together and said board member to the grown surface side of said nozzle sheet aforementioned nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink-jet printer wherein a regurgitation nozzle row for said every color is formed so that a sequence may be accomplished to approximately straight line shape and said board member is arranged so that a sequence may be accomplished for said

regurgitation nozzle at 1 in all linear shape.

[Claim 28]The ink-jet printer according to claim 27wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 29]In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print spanand which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink-jet printerwherein a regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined numberand said board member is arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[Claim 30]The ink jet print head according to claim 29wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 31]In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print spanand which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. An ink-jet printerwherein a regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined numberand said board member is arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[Claim 32]The ink-jet printer according to claim 31wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 33]In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print spanand which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board member for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. Double a position with said nozzle sheetpaste togetherand so that said regurgitation nozzle and said recording element may correspond and a regurgitation nozzle row for said every colorAn ink-jet printerwherein it is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined numberand a sequence may be accomplished alternatelyand said board member is arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[Claim 34]The ink-jet printer according to claim 33wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 35]In an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print spanand which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and a sequence may be accomplished alternatelyAn ink-jet printerwherein said board member is arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[Claim 36]The ink-jet printer according to claim 35wherein a nozzle sheet is formed by a metal electroforming layer of material containing nickel or this nickel and changes.

[Claim 37]A manufacturing method of an ink jet print head characterized by comprising the following with which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span.

A process which makes a regist layer of a predetermined pattern according to a path and an interval of said regurgitation nozzle of a regurgitation nozzle row for ink each color of every form with an insulating photoresist material on a substrate which has conductivity.

A process which makes an electroforming layer form in a portion in which a regist layer on said substrate is not formed selectively using predetermined metal.

A process of removing said regist layer.

A process of exfoliating said electroforming layer from said substrate.

A process of doubling and pasting a position together to a nozzle sheet produced [electroforming layer / said] from said substrate by exfoliating in a board member which carries out two or more owners of said recording element so that said regurgitation nozzle and said recording element might correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color.

[Claim 38]A manufacturing method of the print head according to claim 37 using material which contains nickel at a process in which an electroforming layer is made to form.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]the full by which the recording element of plurality [this invention / direction / of a print span] was arranged -- multi-(printing depended in full color is possible) -- it is related with the ink-jet printer provided with an ink jet print head and thisand the manufacturing method of an ink jet print head. By being formed by the electroforming layer of predetermined metalchanging in detailand having one nozzle sheet in which the regurgitation nozzle row for ink each color of every of a predetermined plural color was formedThe art of being able to prevent deterioration of the printing grade by position gap of a regurgitation nozzleand attaining stabilization of the discharging angle of ink is started.

[0002]

[Description of the Prior Art]The regurgitation nozzle row for the print span to this record paper is arranged one by one for every color in the direction which intersects perpendicularly with the transportation direction of a record paper mostly with the demand of improvement in the speed of press speed in recent yearsBy making an ink drop fly selectively from each regurgitation nozzleand making it adhere on a record paperconveying a record paperThe ink-jet printer (only henceforth a line printer) of the line printing method which can color-print a desired picture attracts attentionwithout moving the print head which has a regurgitation nozzle.

[0003]As a printer of the thermal method using the heating resistor as an energy generation element which generates the pressure energy for making ink breathe out from a regurgitation nozzle among the above line printersIt is indicated by JP2001-71495A about the line printer which put two or more head chips in order and constituted the print head. By heating the ink held at the liquid ink room with the heater which is a heating resistorthe above-mentioned head chip is constituted so that an ink drop may be made to fly from a regurgitation nozzle.

The heater such for [two or more] a regurgitation nozzleetc. are created on one semiconductor substrateand it is constituted.

[0004]In the above-mentioned printeran entire configuration can be simplified by putting in order two or more above-mentioned head chips for every ink of each colorand forming the print head of a line printing method. It compares with the ink-jet printer of the type which a print head scans in the above-mentioned printer since a print head does not need to scan in the direction of a print spanSince the anchorage device is unnecessary even if it compares with the laser beam printer which can color-print an electrophotographying system accelerableit has the strong point in which a fast printing time is short.

[0005]

[Problem(s) to be Solved by the Invention]Howeverin the above conventional line printerssince there were the following problemsthe utilization was difficult. Since the regurgitation nozzle was positioned in the former according to the head chipWhen the print head of the ink of arbitrary colors was made to form and the locational error of each head chip arose the position gap occurred for the regurgitation nozzle of the ink of the colorthe gap arose in the impact position of ink by thisand there was a problem of reducing a printing grade. This originates in having structure with the regurgitation nozzle corresponding to each head chip.

[0006]The above-mentioned problem is explained using drawing 14. When (A) of drawing 14 shifts the head chips 30A-30D of the ink of arbitrary colors by turns to page orientationhas arranged them to itfor example (alternate arrangement) and constitutes a print headThe case where a regurgitation nozzle arises at equal intervals and the gap has not arisen in arrangementi.e.the arranged position of a head chipis shown in the line direction of the head chips 30A-30Dandon the other hand(B) - (D) of drawing 14 shows the case where a gap arises in the arranged position of a head chip.

[0007]Among thesethe head chip 30C shows drawing 14 (B) to the arrangement direction of the head chipand the case where a position gap is carried out in this caseWhen the pitch of a regurgitation nozzle is confused****-like printing unevenness will occur in the transportation direction of a paper on the boundary of this head chip 30C that carried out the position gapand the adjoining head chips 30B and 30D. The head chip 30B shows drawing 14 (C) to the

transportation direction of the paper and the case where a position gap is carried out in this case. When a lateral straight line is printed for example by the regurgitation nozzle of this head chip 30B carrying out a position gap and arranging it in the part of this position gap and the transportation direction of a paper a picture gap will arise in the print area corresponding to the head chip 30B and a straight line will be printed stair-like.

[0008] Drawing 14.(D) shows the case where the head chip 30D inclined and has been arranged and when a lateral straight line is printed by the regurgitation nozzle of this head chip 30D inclining and arranging it in this case for example a straight line will bend and it will be printed. Since nozzle intervals become large by the head chip 30C and the head chip 30D when a solid black image is printed a white stripe will occur.

[0009] Since the regurgitation nozzle is positioned according to the head chip as mentioned above. Even if the accuracy of position of a head chip improves within 1 color yellow. In putting in order magenta cyanogen and the head chip sequence of the ink of black each color and making the print head for color printing form. When the locational error of the head chip sequence of each color arises as JP7-115504B is also indicated. The position gap occurred for the regurgitation nozzle of the ink between each color it led to the so-called degradation of registration and degradation of color reproduction nature and there was a problem of reducing a printing grade like the above.

[0010] The above-mentioned problem is explained using drawing 15. By drawing 15 the accuracy of position of the head chip within monochrome explains as a premise the case of being satisfactory. (A) of drawing 15 head chip arrangement to a recording form (paper) transportation direction Yellow (Y) the case in which the head chip sequence of the specific color carried out the position gap where it carries out being shown in the direction of a print span and in this case when it has arranged in order of magenta (M) cyanogen (C) and black (K) To the picture in the ink of other colors the picture by the magenta (M) which is a color which this head chip sequence that carried out the position gap takes charge of will carry out a position gap and will be printed by the transverse direction (arrangement direction of each head chip).

[0011] Drawing 15.(B) shows the case where the head chip sequence (in this case it is a head chip sequence of yellow (Y)) of the specific color carried out the position gap and the head chip sequence has been arranged in the recording paper conveyance direction. In this case to the picture in the ink of other colors the picture of the yellow which is a color which this head chip sequence that carried out the position gap takes charge of will carry out a position gap and will be printed by the transportation direction of a paper.

[0012] Drawing 15.(C) is a head chip sequence (in this case) of a specific color, magenta (M) cyanogen (C) and the head chip sequence of black (K) -- it is -- the case where it inclines being shown and in this case A record in the paper and a dot space will become short and will be printed and the picture in the ink of the color which this leaning head chip sequence takes charge of will be printed in the state twisted to the picture in the ink of other colors. i.e. the state where it is inclined.

[0013] As mentioned above high degree of accuracy is required of the position of the regurgitation nozzle of ink in order to affect a printing grade greatly. It is important especially when it is a printer in which especially printing with a plural color is possible. On the other hand in order to affect a printing grade greatly also about the shape of the regurgitation nozzle of ink high degree of accuracy is required. (in order that the sectional shape of a regurgitation nozzle may stabilize the discharging angle of ink (i.e. in order to raise the impact accuracy of ink) in order), the regurgitation nozzle 31 shown in drawing 4 -- the shape (it becomes narrow) where it became narrower smoothly toward the outside (regurgitation side side) from the inside (head chip 25 side) of the print head like is preferred. If this will be from the inside of a print head in an extended state toward the outside ink is spread and is breathed out and the impact position accuracy in the record paper of ink falls.

[0014] This invention is made in view of the above points and is a thing.

The ink jet print head provided with the ink jet print head and this aiming at stabilization of the impact position of the recording form of the ink which the purpose could prevent deterioration of the printing grade by position gap of ** and was breathed out. And it is providing the manufacturing method of an ink jet print head.

[0015]

[Means for Solving the Problem] An ink jet print head concerning this invention. In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span. By being characterized by having one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed it is going to solve an aforementioned problem.

[0016] An ink jet print head concerning this invention. In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span. It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed. By carrying out two or more owners of the board member which carries out two or more owners of said recording element doubling a position with said nozzle sheet pasting said board member together so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color and being characterized by things. It is going to solve an aforementioned problem.

[0017] An ink jet print head concerning this invention. In an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span. It has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a

regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board memberBy doubling and pasting a position together to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every colorand being characterized by thingsit is going to solve an aforementioned problem.

[0018]An ink jet print head concerning this inventionIn an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be accomplished in said direction of a print span at approximately straight line shapeand said board member tends to solve an aforementioned problem by being characterized by being arranged so that a sequence may be accomplished for said regurgitation nozzle at 1 in all linear shape.

[0019]An ink jet print head concerning this inventionIn an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheet aforementioned nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be accomplished to approximately straight line shapeand said board member tends to solve an aforementioned problem by being characterized by being arranged so that a sequence may be accomplished for said regurgitation nozzle at 1 in all linear shape.

[0020]An ink jet print head concerning this inventionIn an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished for every regurgitation nozzle of said predetermined numberand said board member tends to solve an aforementioned problem by being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[0021]An ink jet print head concerning this inventionIn an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished for every regurgitation nozzle of said predetermined numberand said board member tends to solve an aforementioned problem by being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[0022]An ink jet print head concerning this inventionIn an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board member for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. Double a position with said nozzle sheetpaste togetherand so that said regurgitation nozzle and said recording element may correspond and a regurgitation nozzle row for said every colorIt is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and a sequence may be accomplished alternatelyBy being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzlesaid board member tends to solve an aforementioned problem.

[0023]An ink jet print head concerning this inventionIn an ink jet print head by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a

regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and a sequence may be accomplished alternatelyBy being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzlesaid board member tends to solve an aforementioned problem.

[0024]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print spanBy being characterized by having one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedBy being carried out two or more owners of the board member which carries out two or more owners of said recording elementdoubling a position with said nozzle sheetpasting said board member together so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every colorand being characterized by thingsIt is going to solve an aforementioned problem.

[0025]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedBy carrying out two or more owners of the board member which carries out two or more owners of said recording elementdoubling a position with said nozzle sheetpasting said board member together so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every colorand being characterized by thingsIt is going to solve an aforementioned problem.

[0026]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedCarry out two or more owners of the board member which carries out two or more owners of said recording elementand said board memberBy doubling and pasting a position together to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every colorand being characterized by thingsIt is going to solve an aforementioned problem.

[0027]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be accomplished to approximately straight line shapeand said board member tends to solve an aforementioned problem by being characterized by being arranged so that a sequence may be accomplished for said regurgitation nozzle at 1 in all linear shape.

[0028]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge which has the ink jet print head by which multiple arrays were carried out in the direction of a print spanIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together and said board member to the grown surface side of said nozzle sheet aforementioned nozzle sheetso that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be accomplished to approximately straight line shapeand said board member tends to solve an aforementioned problem by being characterized by being arranged so that a sequence may be accomplished for said regurgitation nozzle at 1 in all linear shape.

[0029]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print spanand which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layerand changedand a regurgitation nozzle row for ink each color of every was formedtwo or more owners of the board member which carries out two or more owners of said recording element being carried outand a position being doubledand it pasting together to said nozzle sheetand said board member so that said regurgitation nozzle and said recording element may correspond for said every regurgitation

nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and said board member tends to solve an aforementioned problem by being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[0030]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print span and which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed two or more owners of the board member which carries out two or more owners of said recording element being carried out and a position being doubled and it pasting together and said board member to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a sequence may be alternately accomplished to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and said board member tends to solve an aforementioned problem by being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzle.

[0031]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print span and which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed Carry out two or more owners of the board member which carries out two or more owners of said recording element and said board member for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. Double a position with said nozzle sheet paste together and so that said regurgitation nozzle and said recording element may correspond and a regurgitation nozzle row for said every color It is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and a sequence may be accomplished alternately By being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzle said board member tends to solve an aforementioned problem.

[0032]An ink-jet printer concerning this inventionIn an ink-jet printer with which a recording element for making ink breathe out from a regurgitation nozzle was provided with an exchangeable head cartridge by which multiple arrays were carried out in the direction of a print span and which carries out an ink jet print head ownerIt has one nozzle sheet in which it was formed by a predetermined metal electroforming layer and changed and a regurgitation nozzle row for ink each color of every was formed two or more owners of the board member which carries out two or more owners of said recording element being carried out and a position being doubled and it pasting together and said board member to the grown surface side of said nozzle sheet so that said regurgitation nozzle and said recording element may correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color. A regurgitation nozzle row for said every color is formed so that a part of regurgitation nozzles of said predetermined number may overlap to a transportation direction of a recording medium for every regurgitation nozzle of said predetermined number and a sequence may be accomplished alternately By being characterized by being arranged in the shape of 1000 in all birds at said regurgitation nozzle said board member tends to solve an aforementioned problem.

[0033]A manufacturing method of an ink jet print head concerning this inventionIn a manufacturing method of an ink jet print head with which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span A process which makes a regist layer of a predetermined pattern according to a path and an interval of said regurgitation nozzle of a regurgitation nozzle row for ink each color of every form with an insulating photoresist material on a substrate which has conductivity A process which makes an electroforming layer form in a portion in which a regist layer on said substrate is not formed selectively using predetermined metal A process of removing said regist layer and a process of exfoliating said electroforming layer from said substrate A board member which carries out two or more owners of said recording element By being characterized by having the process of doubling and pasting a position together to a nozzle sheet produced from said substrate by exfoliating in said electroforming layer so that said regurgitation nozzle and said recording element might correspond for said every regurgitation nozzle of a predetermined number of a regurgitation nozzle row for said every color It is going to solve an aforementioned problem.

[0034] [Embodiment of the Invention] Hereafter it explains referring to drawings for an embodiment of the invention. (A 1st embodiment) As shown in drawing 1 the ink jet print head (only henceforth a head) 21 of the line printing method by which the multiple arrays of the recording element for making ink breathe out from a regurgitation nozzle were carried out in the direction of a print span is provided with the following. It is formed by the electroforming layer of the material containing nickel or nickel and changes Yellow magenta cyanogen the nozzle sheet 23 in which yellow magenta cyanogen and the regurgitation nozzle row of black each color are formed in approximately straight line shape at four rows and change in the direction (the direction of a print span) which crosses a paper respectively so that it may correspond to printing of black.

Two or more head chips (board member) 25 which have been arranged one by one on the nozzle sheet 2 at straight line shape according to the regurgitation nozzle row of each of this colorand were pasted together to the nozzle sheet 23. The member 26 which concavo-convex processing is performed to the field by the side of this head chip 25is stuck on the nozzle sheet 23and forms the channel of ink in behind between the head cartridges 20 of drawing 13.

[0035]The drive circuit 29 which drives these heaters 28 while processing the silicon substrate 27 by integrated circuit artbeing formedand being formed so that the heater 28 which is a heater element (recording element) which heats ink may be located in a line one by one as the head chip 25 is shown in drawing 3 is formed. The nozzle sheet 23 is processed so that the opening by round cross section shape may be arranged on these each heater 28The regurgitation nozzle 31 which the septum of each heater 28etc. are formed [nozzle] with the dry film 24and the liquid ink room 30 is formed [nozzle] in each heater 28 by thisrespectivelyand makes an ink drop fly with the nozzle sheet 23 is formed.

[0036]Such a heater 28 is arranged near the sideand if the dry film 24 is in the side [in which this heater 28 has been arranged] sidethe head chip 25 is formed in the shape of [of the comb] a gear tooth so that the liquid ink room 30 may be exposed. The ink passage 33 is formed with the member 26 and the dry film 24 so that the head 21 may lead the ink cartridge YMand C of drawing 13and the ink of B from the this side to expose. Thereby with the head 21it is made as [lead / to the liquid ink room 30 of each heater 28 / from the edge side of the longitudinal direction of the head chip 25 / ink].

[0037]With the side which has arranged the heater 28the pad 34 is formed in a reverse side and the head chip 25 is made as [drive / the flexible wiring board 35 / to this pad 34 / connect and]. By thes the ink discharge mechanism in which an ink drop is made to fly from the regurgitation nozzle 31 in the head 21It is made as [constitute / arrange the heater 28 which is a part of this ink discharge mechanism one by oneand / are constituted by the heater 28the liquid ink room 30and the regurgitation nozzle 31and / the head chip 25].

[0038]Drawing 5 shows the array constitution of the head chip 25 by this embodimentand is the figure to which the part was expanded from the paper 14 side of drawing 13. As shown in drawing 5on the nozzle sheet 23the head chip 25 by an identical configuration arrangesand is constituted by straight line shape at one side of the ink passage 33 of the ink of each color.

[0039][the head 21 makes a unit the regurgitation nozzle 31 of a continuous prescribed numberand grouping of each regurgitation nozzle 31 is carried outand / in each group]The nozzle sheet 23 is createdand it is formed in the position which the heater 28 of the head chip 25 made these prescribed numbers the unitand shifted in the direction of a form feed so that it may correspond to this nozzle sheet 23so that the regurgitation nozzle 31 may shift in the direction of a form feed. In drawing 5the shift amount of this direction of a form feed is exaggerated and shown. In drawing 5it explains by the case where made seven regurgitation nozzles into the unit and grouping is carried out to three groups for simplification of explanationetc.

[0040]Thereby in the head chip 25it is made as [drive / the heater which carried out grouping / using effectively the regurgitation nozzle shifted to the direction of a form feed in this way / one by one]. The driving order of the heater 28 is explained using drawing 6 and drawing 7. The seven regurgitation nozzles 31 which constitute each group are managed by the stage of the phase 1 - the phase 7 one by one from the regurgitation nozzle 31 by the side of penetration of the paper 14. In drawing 6 and drawing 7the number corresponding to each phase is given to a regurgitation nozzleand is shown.

[0041]If the paper 14 of drawing 13 is sent as shown in drawing 6 (A)by the phase 1 to beginthe regurgitation nozzle 1 by the side of paper penetration will be driven mostand the dot D1 will be created. If the paper 14 is sent (drawing 6 (B))only the part to the regurgitation nozzle 2 which furthermore continues will drive this continuing regurgitation nozzle 2will create the dot D2and will create a dot one by one by the drive of the regurgitation nozzles 3-7 which synchronized with such a form feed one by one (drawing 6 (C) - drawing 7 (G)). Thereby by this embodimentit is made as [drive / it / simultaneously] about the regurgitation nozzle 31 to which it is made as [drive / timing / about the regurgitation nozzle 31 in one group / shift and]and each group corresponds.

[0042]By changing the number of the drops which create by the drop which creates one dot and create this one dothe head 21 changes the size of a dot andtherebyexpresses gradation. In this embodimentit is made as [create / one dot / by eight drops / at the maximum].

[0043]Nextthe preparation method of the above-mentioned nozzle sheet 23 is explained using drawing 2. For simplification of explanationit extracts to the regurgitation nozzle of one copyand drawing 2 explains. Firstas shown in drawing 2 (B) on the stainless substrate (matrix) 101 with a thickness of about 1 mm shown in drawing 2 (A) which is a substrate of a conductorThe about 14-15-micrometer-thick regist layer 102 is made to form with an insulating photoresist materialand the interval between nozzles whose path of each regurgitation nozzle of the regurgitation nozzle row of each color is an interval of the center of the regurgitation nozzle which adjoins each other about 17 micrometers is about 42 micrometersAs shown in drawing 5the mask 104 is used only for the regist layer 103 of the pattern for arranging the regurgitation nozzle of the regurgitation nozzle row for every color to approximately straight line shape in the direction of a print spanand it is irradiated with a laser beam.

[0044]Nextas are shown in drawing 2 (C)and negatives are developed and it is shown in drawing 2 (D)The electroforming layer 105 of the material which contains nickel about 12 micrometers thick or nickel in the portion in which the regist layer 103 on the substrate (matrix) 101 is not formed selectively using the material containing nickel is made to form (it plates). Thenas shown in drawing 2 (E)the regist layer 103 is removed. And as shown in drawing 2

(F) the electroforming layer 105 is exfoliated from the substrate 101 and the nozzle sheet 23 is created.

[0045] As a preparation method of the nozzle sheet which has a regurgitation nozzle row of each above-mentioned color how to create by etching otherwise and the method of carrying out punching to a nozzle sheet can be considered. However in creating by etching it uses wet etching but since it is isotropic etching it is difficult [it] to create a regurgitation nozzle with high hole diameter precision.

[0046] When the edge of a punch is exchanged by the method by punching it is difficult to maintain vacating the hole equivalent to the regurgitation nozzle of the same shape and a path and its reproducibility is bad. By the method by punching when a hole is vacated a barricade will remain secondary elaboration will be needed and a manufacturing cost will also be applied.

[0047] From the reason for the above the nozzle sheet was created by electrocasting by the material which contains nickel or nickel for the regurgitation nozzle of the same shape simultaneously required on a nozzle sheet and a path since [high] accuracy-of-position formation can be carried out and reproducibility is good. By the thing it was made to make form the electroforming layer 105 in this embodiment lower (thinly) than the regist layer 103. By the sectional shape of the regurgitation nozzle 31 turning into the shape (it becomes narrow) where it became narrower smoothly in the direction of a grown surface as shown in drawing 4 and sticking the head chip 25 on the grown surface side of the electroforming layer 105 using this shape. The discharging angle of ink can be stabilized and the impact accuracy of ink can be raised. In drawing 4 in order to make intelligible physical relationship of the nozzle sheet 31 and the head chip 25 other components are omitted.

[0048] Although nickel excellent in ink-proof nature etc. was used as a material of an electroforming layer i.e. a nozzle sheet in this embodiment it is also possible to create a nozzle sheet using copper. Although stainless steel was used as the substrate 101 this is to excel in flat voltinism and for a natural oxidation film to improve detachability and may carry out the weld slag of the chromium on [other than stainless steel] a glass substrate.

[0049] As an energy generation element which generates the pressure energy for making ink breathe out from each regurgitation nozzle of the regurgitation nozzle row for every color formed in the nozzle sheet 23 produced by exfoliating the electroforming layer 105 from the substrate 101 as mentioned above. The discharge direction and the 28th page of heater (recording element) of ink arrange vertically the head chip 25 which has the ** heater 28 and it is pasted together to the nozzle sheet 23 respectively so that it may become a face shooter method as shown in drawing 3. In addition -- this embodiment -- a face shooter method -- ink -- the regurgitation -- it was made like because it was stabilized and the head chip 25 was stuck to a nozzle sheet.

[0050] As mentioned above since the regurgitation nozzle row of each color sticks the head chip 25 on the one nozzle sheet 23 formed with high accuracy of position and makes a print head form even when the head chip 25 carries out a position gap it can prevent about a position gap of a regurgitation nozzle.

[0051] This reason is explained using drawing 12, a specific head chip sequence inclining in the direction of a form feed and being arranged at it when a position gap is carried out (drawing 12 (B)) when [in which the head chip sequence of the specific color carried out the position gap in the head chip column direction] it carries out (drawing 12 (A)) as shown in (A) - (C) of drawing 12 (drawing 12 (C)) but. Since the regurgitation nozzle is formed with high positioning accuracy on the nozzle sheet a position gap of the regurgitation nozzle of the ink between each color can be prevented.

[0052] Thus according to this embodiment since stabilization of the impact position to the paper of the ink which could prevent deterioration of the printing grade by position gap of a regurgitation nozzle and was breathed out can be attained improvement in a printing grade can be aimed at. Although this embodiment explained as a line printer of the thermal method which makes the ink by the drive of a heater breathe out this invention can be replaced with the drive of not only this but a heater and can be applied to the line printer of the method by the drive of piezoelectric elements such as a piezo-electric element etc.

[0053] The line printer provided with the above-mentioned print head 21 is explained using drawing 13. The whole is stored and formed in the case 12 of rectangular form and the line printer 11 is made as [feed / to the paper 14 / paper] by equipping with the paper tray 13 which stored the paper 14 as a recording medium from the tray gateway formed in the transverse plane of this case 12.

[0054] When the line printer 11 is equipped with the paper tray 13 from a tray gateway in this way it is pressed against the feed roller 16 by the paper 14 with a predetermined mechanism and by rotation of this feed roller 16. As the direction of arrow A shows the paper 14 is sent out toward the back side of the line printer 11 from the paper tray 13. As the reversal roller 17 is arranged at this form-feed side and the arrow B shows the line printer 11 by rotation of this reversal roller 17 etc. the feed direction of the paper 14 is switched to a front direction.

[0055] The line printer 11 is carried out in this way it is conveyed by spur roller 18 grade so that the paper 14 with which it comes to switch the direction of a form feed in the direction shown by the arrow B may cross the paper tray 13 top and as shown in the arrow C it is discharged from the outlet arranged at the transverse-plane side of the line printer 11. The head cartridge 20 is arranged exchangeable so that the arrow D may show the line printer 11 from this spur roller 18 before an outlet.

[0056] As for the head cartridge 20 the head 21 arranged respectively is arranged in the line head of yellow magenta cyanogen and black at the undersurface side of the electrode holder 22 of specified shape respectively. It is made as [form / in it / arrange the ink cartridge YM and C of yellow magenta cyanogen and black and B in this electrode holder 22 one by one and]. Thereby the line printer 11 is made as [print / it is made to adhere to the paper 14 and / from the line head corresponding to the ink of these each color / a picture]. Since the accuracy of position of each

regurgitation nozzle is compensated by having a nozzle sheet used as 4 color one by which it is characterized [of this invention] as mentioned aboveexchange of a cartridge also becomes easy compared with the former.

[0057](A 2nd embodiment) In a 1st embodiment of the above. The regurgitation nozzle row for ink each color of every was formed in four rows at approximately straight line shape in the direction (the direction of a print span) which crosses a paper to the nozzle sheet 23respectivelyexplained the case where it was arranged on the nozzle sheet so that the head chip 25 might constitute a sequence to 1 in all linear shape at a regurgitation nozzlebut. By this embodiment is formed so that the regurgitation nozzle row for ink each color of every may constitute a sequence alternately (to alternation) for every regurgitation nozzle of a predetermined number to a nozzle sheetand the case where the head chip 25 is arranged on the nozzle sheet in the shape of 1000 in all birds at the regurgitation nozzle is explained. About other compositionit is the same as that of a 1st embodimentand explanation is omitted. Since the same may be said of the preparation method of a nozzle sheetexplanation is omitted.

[0058]The head 21 is provided with the following as shown in drawing 8.

It is formed by the electroforming layer of the material containing nickel or nickeland changesThe nozzle sheet 23 in which the interval of each regurgitation nozzle is alternately formed in four rows for every regurgitation nozzle of a predetermined numberand changes in yellowmagentacyanogenand the direction (the direction of a print span) in which yellowmagentacyanogenand the regurgitation nozzle row of black each color cross a paperrespectively so that it may correspond to printing of black at equal intervals.

Two or more head chips (board member) 25 which have been alternately arranged on the nozzle sheet 23 according to the regurgitation nozzle row of each of this colorand were pasted together to the nozzle sheet 23.

The member 26 which concavo-convex processing is performed to the field by the side of this head chip 25is stuck on the nozzle sheet 23and forms the channel of ink in behind between the head cartridges 20 of drawing 13.

[0059]Drawing 9 shows the array constitution of the head chip 25 by this embodimentand is the figure to which the part was expanded from the paper 14 side of drawing 13. As shown in drawing 9by turns (alternately)on the nozzle sheet 23the head chip 25 by an identical configuration arrangesand is constituted by the both sides of the ink passage 33 of the ink of each color. In each head chip 25it is arranged so that the heater 28 may become the ink passage siderespectivelythat isvia the ink passage 33 sidethe head chip 25 of both sides is arranged so that it may become the relation which direction rotated 180 degrees. Therebythe head 21 is made as [supply / in each color /respectively / in the one ink passage 33 / to each head chip 25 / ink]and can high-resolution-ize printing accuracy by the part and simple composition.

[0060]So that the position of the pad 34 may not change in the direction with which the regurgitation nozzle 31 is located in a lineeven when the head chip 25 is carried out in this wayand it rotates 180 degrees and has arrangedthe direction (the direction of a print span) with which these regurgitation nozzle 31 is located in a line -- the pad 34 being mostly arranged in the center and with the head 21 thereby. The flexible wiring board linked to the pad 34 of the adjacent head chip 25 is prevented from approachingthat isit is made as [prevent / the concentration to a part of flexible wiring board].

[0061]When it does in this way and a regurgitation nozzle is shiftedin the upper part of the ink passage 33and the head chip arranged caudadthe driving order of a heater will be reversed to a driving signal. In this embodimenteach head chip 25 is constituted so that it may correspond to such driving orderand the driving order in a drive circuit can be switched.

[0062]Thusin this embodiment. The regurgitation nozzle row of ink each colorrespectively a paper. The interval between nozzles which is an interval of the center of the regurgitation nozzle which adjoins each other in the direction (the direction of a print span) to cross sticking the head chip 25 on the one nozzle sheet 23 alternately formed in four rows with high accuracy of position for every regurgitation nozzle of a predetermined number at equal intervalsand having made it make a print head form A sakeStabilization of the impact position to the paper of the ink which could prevent deterioration of the printing grade by position gap of a regurgitation nozzleand was breathed out like a 1st embodiment of the above can be attainedand the path of a regurgitation nozzle can be made small and high resolutionization can be attained by narrowing the interval between nozzles.

[0063](A 3rd embodiment) In a 2nd embodiment of the above. The interval of each regurgitation nozzle is alternately formed in the direction (the direction of a print span) to which the regurgitation nozzle row of ink each color crosses a paper to the nozzle sheet 23respectively for every regurgitation nozzle of a predetermined number at equal intervals at four rowsAlthough the case where the head chip 25 was alternately arranged on the nozzle sheet 23 according to the regurgitation nozzle row was explainedThis example of an embodiment explains the case where a regurgitation nozzle is further formed so that a part of regurgitation nozzles of said predetermined number may overlap to the transportation direction (transportation direction of a recording medium) of a paper and a sequence may be accomplished alternately.

[0064]Drawing 10 shows the array constitution of the head chip 25 by this embodimentand is the figure to which the part was expanded from the paper 14 side of drawing 13. As shown in drawing 10the regurgitation nozzle 31 is arranged so that the regurgitation nozzle of the regurgitation nozzle row for every color may be arranged alternately and three regurgitation nozzles in the adjacent regurgitation nozzle arranged alternately may overlap seen from the feed direction of a paper.

[0065]By the above-mentioned compositionabout the areas of overlap which the dot creation part by a regurgitation nozzle adjoins. It can be made as [make / the dot by two head chips which these-adjoin / intermingled]dispersion in

the characteristic between the head chips which adjoin by mixture of this dot can be made not conspicuous and deterioration of a printing grade can be prevented.

[0066] When (A) of drawing 11 shifts the head chip 25 of the ink of arbitrary colors by turns to page orientation has arranged it to it for example (alternate arrangement) and constitutes a print head. The case where a regurgitation nozzle arises at equal intervals and the gap has not arisen in arrangement. i.e. the arranged position of a head chip is shown in the line direction of the head chip 25. When the head chip 25 carries out the position gap of the (B) of drawing 11 in the line direction of the head which aims to intersect perpendicularly with the direction of a form feed and the head chip 25 carries out the position gap of the (C) of drawing 11 in the direction of a form feed it shows the case where the head chip 25 inclined and (D) of drawing 11 has been arranged further.

[0067] Since the regurgitation nozzle is formed with high positioning accuracy on the nozzle sheet even if head chip 25 the very thing carries out a position gap so that (B) - (D) of drawing 11 may show it can prevent about a position gap of the regurgitation nozzle within the same color.

[0068] Thus since the regurgitation nozzle was further formed in this embodiment so that a part of regurgitation nozzles of said predetermined number might overlap to the transportation direction (transportation direction of a recording medium) of a paper and a sequence might be accomplished alternately. Deterioration of the printing grade by position gap of a regurgitation nozzle can be prevented like a 2nd embodiment of the above. And stabilization of the impact position to the paper of the breathed-out ink can be attained and the path of a regurgitation nozzle is made small by narrowing the interval between nozzles. High resolution-ization can be attained and dispersion in the characteristic between the head chips which adjoin further can be made not conspicuous and deterioration of a printing grade can be prevented.

[0069]

[Effect of the Invention] As explained above according to this invention deterioration of the printing grade by position gap of a regurgitation nozzle can be prevented and it is effective in the ability to say that stabilization of the discharging angle of ink can be attained.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is an exploded perspective view showing the detailed composition of the head by a 1st embodiment.

[Drawing 2] It is an explanatory view showing the creation process of the nozzle sheet by this embodiment.

[Drawing 3] It is a sectional view showing the detailed composition of the head by this embodiment.

[Drawing 4] It is a sectional view showing the physical relationship of the head chip and nozzle sheet by this embodiment.

[Drawing 5] It is a top view showing the array constitution of the 1st embodiment head chip.

[Drawing 6] It is an explanatory view showing the driving order of the heater by this embodiment.

[Drawing 7] It is an explanatory view showing the driving order of the heater by this embodiment.

[Drawing 8] It is an exploded perspective view showing the detailed composition of the head by a 2nd embodiment.

[Drawing 9] It is a top view showing the array constitution of the head chip by a 2nd embodiment.

[Drawing 10] It is a top view showing the array constitution of the head chip by a 3rd embodiment.

[Drawing 11] It is an explanatory view showing the position of the head chip sequence of each color at the time of a gap arising in the arranged position of the head chip sequence of each color within the print head by a 3rd embodiment.

[Drawing 12] It is an explanatory view showing each head chip position at the time of a gap arising in the arranged position of the head chip of arbitrary colors within the print head of a 1st embodiment.

[Drawing 13] It is a perspective view showing the internal configuration of the line printer by this embodiment.

[Drawing 14] It is an explanatory view showing each head chip position at the time of a gap arising in the arranged position of a head chip within the print head of the ink of the arbitrary colors of a conventional example.

[Drawing 15] It is an explanatory view showing the position of the head chip sequence of each color at the time of a gap arising in the arranged position of the head chip sequence of each color within the print head for color printing of a conventional example.

[Description of Notations]

21 Head

23 Nozzle sheet

25 Head chip (board member)

28 Heater

31 Regurgitation nozzle

101 Substrate

102 Regist layer

103 Regist layer

104 Mask

105 Electroforming layer
